NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Storm Courier

Charleston, SC
Weather Forecast Office

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Inside this issue:

Another Active Hurricane Season

by Robert Bright — Tropical Program Leader

The 2012 Atlantic hurricane season officially ended November 30 and it has been another busier than normal year in terms of tropical cyclone activity with 19 tropical cyclones, 10 of which became hurricanes. On average (from 1981 to 2010), 12 tropical storms, 6 hurricanes and 3 major hurricanes develop each season.

This season certainly got off to a quick start with Tropical Storms Alberto and Beryl developing off the Southeast U.S. coast in mid-late May, before the official beginning of the hurricane season on June 1. Although Alberto remained offshore without producing significant impacts on the local area, Beryl was a slightly stronger tropical storm which moved inland across northern Florida before weakening into a tropical depression and moving northeast across southeast GA and SC. Beryl produced about 5 inches of rainfall in parts of our County Warning Area.

Only one storm (Michael) reached major hurricane status (Category 3, 4, or 5 on the Saffir-Simpson Hurricane Wind Scale), although it remained out in the central Atlantic. This marks a record seventh straight season in which no major hurricanes have made landfall in the United States. Hurricane Isaac (Category 1) was the only hurricane to make landfall in the United States, striking the Louisiana coast in late August with a significant storm surge. Lastly, Hurricane Sandy brushed by in late October producing mainly high surf and some beach erosion.

For more information on the 2012 Atlantic hurricane season as well as hurricane history and safety information, check out the National Hurricane Center's website at http://hurricanes.gov/.

For a history of tropical storms and hurricanes that have affected the local area, check out this site.

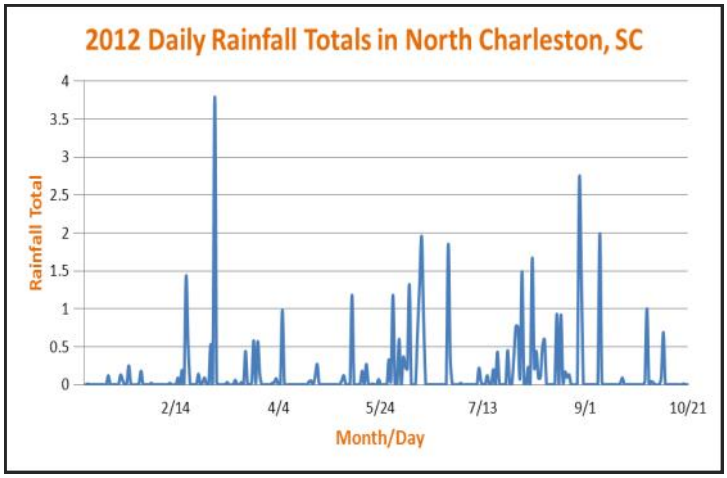
Record Your Rainfall...and Tell the World

by Julie Packett — CoCoRaHS Program Coordinator

Have you ever wondered how much rain falls in your neighborhood or community? If so, then consider joining CoCoRaHS, the Community Collaborative Rain, Hail & Snow Network. It's a fun, educational and voluntary program to monitor precipitation patterns and variability on a small scale, like within a neighborhood. The simplicity of this program makes it ideal for all ages and backgrounds.

CoCoRaHS observers take daily observations right from their backyard or schoolyard then enter their report into the CoCoRaHS interactive web site. Therefore, all you need to join this program is an official CoCoRaHS rain gauge, internet access, and a desire to become involved with your community's weather history. It's that simple!

The chart shows daily rainfall observations taken at a CoCoRaHS site in North Charleston, SC. As of October 21, this site recorded 43.71 inches of rain for the year of 2012. Interestingly, the official climate record at the Charleston Int'l Airport less than a mile away, reported only 38.04 inches of rain for the year of 2012. This difference clearly displays precipitation variability on an exceptionally small scale. Learn more at: http://cocorahs.org/



Come Visit Us at the Charleston Boat Show

by Pete Mohlin — Marine Program Leader

We are pleased to announce that during the last weekend in January 2013, your National Weather Service will be at the Charleston Boat Show. This year we'll be in booth 175 in the main lobby.

We will be there to answer your questions about weather and climate, and provide various free handouts for both adults and children.

We can also provide you with ways to obtain marine weather information and would love to hear your comments regarding how we can improve our products and services.

Be sure to stop by our display table during the following dates and times:

Fri, Jan. 25 — 12 PM to 6 PM

Sat, Jan. 26 — 10 AM to 6 PM

Sun, Jan. 27 — 11 AM to 5 PM

The Charleston Boat Show is held at the Charleston Area Convention Center in North Charleston.

The Storm Spotter Program—We Need Your Help

by Ron Morales — Warning Coordination Meteorologist

Despite the increasing availability of high tech instruments such as Doppler radar, high resolution satellites, and surface observation networks, nothing replaces the need for human eyes and ears to observe and report severe weather damage. Every time your local National Weather Service office issues a Tornado, Severe Thunderstorm, or Flash Flood Warning, they must verify whether the event actually occurred. The verification process is not only essential for increasing the credibility of our warnings, but also for improving our science for detecting and understanding severe weather. If our warnings have no credibility, people won't take them seriously. The big issue now is not whether or not someone received the warning, but whether they understand what the warning means, and what to do to protect themselves and/or their property. That's where you come in.

Each report of a tree down, hail, flooding, tornado, etc. helps to provide confidence to the National Weather Service meteorologist issuing the warning, improves our overall understanding of the science of severe weather, and most importantly, leads to a more credible and believable warning system.

How Do You Become a Storm Spotter?

Before you can become an "official" member of our Storm Spotter Network, you must be trained.

You can either attend training classes provided by our office, or you can now take an online version. The online version is more generic and provides training for severe weather hazards more common across the entire United States. The preferred way to be trained is to attend one of our two hour sessions, typically scheduled during the fall and winter months, just prior to the typical severe weather season.

Note: *The NWS Storm Spotter Training does NOT train participants to be Storm Chasers. Instead, we are training you to properly observe and report severe weather and/or the associated damage.*

More Information

For more detailed information on the Skywarn/ Storm Spotter program and how to become one of our officially trained Storm Spotters, please visit our web site at: www.erh.noaa.gov/chs/skywarn.shtml

What We Need Reported

- Downed trees, limbs, power lines
- Wind damage to structures
- Tornadoes, Waterspouts, Funnel Clouds
- Hail of any size
- Significant Flooding

When making a report, please include your location, either as a street address or intersection including the town. The time of the observed damage or severe weather is also important.

Significant Coastal Flooding in June

by Pete Mohlin — Marine Program Leader

A serious coastal flooding event occurred in June 2012. There were several days of above-normal tides during the full moon and perigee (when the moon is at its closest approach each lunar cycle, or approximately every 28 days). When the full or new moon occur simultaneously with the perigee we have what is called the Perigean Spring Tides.

During a 4-day stretch from June 3rd through June 6th the tides rose to levels where at least shallow coastal flooding occurred, but culminated with levels as high as where more substantial flooding happens.

On June 3rd, the tide gauge at Charleston reached 7.53 feet Mean Lower Low Water (MLLW), while the gauge at Ft. Pulaski near Savannah reached 9.27 ft.

On June 4th, the tide gauge topped out at 7.39 feet MLLW in Charleston and 9.38 feet MLLW at Ft. Pulaski.

On June 5th, the tide gauge recorded its highest level during this event with 7.90 feet MLLW at Charleston. At Ft. Pulaski the level reached 9.65 feet.

Finally on June 6th, the tide gauge at Charleston peaked at 7.85 feet, while at Ft. Pulaski the highest level during the 4 day event showed a gauge reading of 9.76 feet.

Typically shallow coastal flooding begins when tide levels reach 7.0 feet MLLW at Charleston and 9.2 feet MLLW at Ft. Pulaski. More significant coastal flooding starts around 7.8 to 8.0 feet MLLW at Charleston and around 9.8 to 10.0 feet at Ft. Pulaski.

Numerous roads across the coastal counties of southern SC and southeast GA became flooded and in some cases impassable, with reports of vehicles that stalled in the flooding water.

On St. Catherines Island, GA extensive beach erosion was reported. This included the inundation of salt water from the marshes, St. Catherines Sound and the Atlantic, which resulted in countless palm trees down, logs and other debris blocking most beach entrances, and causing a huge cut to develop between the South Beach Pond and the ocean.

TIDAL FLOODING REFERENCE

Location	Flooding Begins	Significant Flooding
Isle of Palms	6.8 feet MLLW	7.7 feet MLLW
Charleston	7.0 feet MLLW	8.0 feet MLLW
Edisto Beach	7.5 feet MLLW	8.5 feet MLLW
Tidal Berkeley	7.5 feet MLLW	8.0 feet MLLW
Beaufort	9.0 feet MLLW	10.0 feet MLLW
Fripp Island	8.0 feet MLLW	9.0 feet MLLW
Hilton Head	9.0 feet MLLW	10.0 feet MLLW
Ft. Pulaski	9.2 feet MLLW	10.0 feet MLLW

Do you know the difference between Coastal Flooding and Flash Flooding?

Coastal Flooding generally refers to saltwater inundation of low-lying, normally dry areas.

Flash Flooding is freshwater flooding caused primarily by heavy rainfall. However, unusually high tides can exacerbate Flash Flooding because water cannot drain as effectively.

Emergency Alerts and Warnings on the Go!

by Ron Morales — Warning Coordination Meteorologist

During the summer of 2012, the Wireless Emergency Alert (WEA) service was rolled out across the nation as part of the Commercial Mobile Alert System (CMAS). This service was developed through a partnership between the Federal Emergency Management Agency (FEMA), the Federal Communications Commission (FCC), wireless carriers, the National Weather Service, and local and state public safety agencies. The intent of the WEA is to enhance public safety, and to help the nation become more "Weather Ready" by automatically broadcasting various extreme weather alerts and other emergency messages directly to your cell phone.

Although there are many other ways to get weather information and alerts on your phone, this service is offered by most of the larger cell phone companies free of charge. Cell customers have the option to turn these messages on or off. The power of the WEA is that it can send emergency alert messages to wherever you and your phone are located using GPS technology.

For example: You might be on vacation in Florida and receive a Tornado Warning alert. You don't necessarily need to know what city or county you are in; your GPS-capable phone will do that for you!

The WEA is a short "text like" message meant to alert you of the threat for a potential hazard in your area. Once you receive the message, you can then follow up via TV, radio, NOAA All Hazards Radio, etc. for additional details on the warning or emergency alert message.

Remember, the WEA is just another way to receive critical weather alerts and other emergency messages. It is always ideal to have multiple ways to receive alerts for your home and/or business. Check with your cell phone company to see if they support WEA and whether your phone is WEA compatible.

In addition to AMBER Alerts, Presidential Alerts concerning national emergencies, and local emergencies requiring evacuation, the following weather alerts are included:

Tsunami Warning
Tornado Warning
Extreme Wind Warning
Flash Flood Warning
Hurricane Warning
Typhoon Warning
Blizzard Warning
Ice Storm Warning
Lake Effect Snow Warning
Dust Storm Warning

Example alert message

Growing Pains with the WEA

The NWS issues warnings such as those for tornadoes and flash floods for specific geographical areas designated by polygon regions. Some cell phone companies may transmit the WEA to their customers located within a specific polygon area, while others may alert on a much larger area, possibly the size of a county or slightly larger. The latter example would represent an "over warning" situation, and may cause customers to become irritated or even turn off the WEA capability of their phone. Please be aware that if you do turn off the ability for your cell phone to receive the WEA messages, you may miss a potentially life threatening warning or other critical alert that could result in personal injury or worse.

So, please be patient with this new system as it develops and becomes better tuned to warn more specific geographic regions. Given millions of people have cell phones in the United States, and billions across the world, the WEA definitely represents the future for critical alert warning systems.

Additional information can be found here

Weather.gov Receives a Facelift

by Jonathan Lamb — Web Team

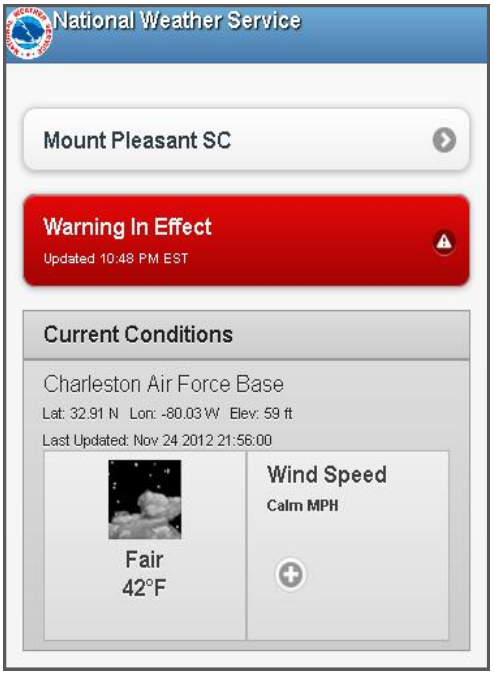
One of many large-scale technology upgrades within the NWS in 2012 has revolved around our website. Most importantly, the servers that run weather.gov have been substantially upgraded. The NWS Internet Dissemination System is faced with a unique challenge due to the large variability in web traffic demands. For example, during a historic Northeast snowstorm in Jan. 2011, NWS websites were receiving a staggering 20 million hits per hour, a more than 10x increase over normal traffic. Thus, the system must be extensible and have multiple redundancies, both of which have been addressed during the recent upgrades.

The design of the NWS websites is also in the process of an overhaul. In July 2012 the national weather.gov site was switched over to a brand new design featuring a simpler, cleaner look with the ability to save one's local forecast using a widget on the left sidebar. An added bonus was the creation of a smartphone-optimized site that can be found at mobile.weather.gov.

The new design at the national weather.gov page is in the process of being migrated to regional and local office pages including ours. The transition was complicated by hardware damages incurred during Superstorm Sandy but we hope to have the new website up and running by early in 2013.

Our new site will be at weather.gov/chs However, until the new site is fully functional, we recommend accessing our local website via www.erh.noaa.gov/chs

mobile.weather.gov



Fire Weather: A Unique Forecasting Challenge

by Robert Bright — Fire Weather Program Leader

NWS Charleston, SC is responsible for weather forecasts and warnings across much of southeast SC and GA as well as the marine area. We forecast not only basic weather elements like temperatures, rain chances, winds and wave heights, but parameters such as mixing height and transport wind. The latter two elements are created specifically for state and federal land managers when preparing for and fighting fires. Such fires include wildfires as well as prescribed fires which are set intentionally in a controlled manner with the goal of forest preservation. In either case, the fire agency will request a specialized forecast of various weather and fire weather elements for the fire's location.

Wildfires are driven by 3 main things: weather, topography and fuels. Of these 3 factors, topography is the least important in this part of the country mainly due to the lack of terrain. Fuels are basically anything that burns, including trees, plants and leaves, but often dead vegetation is most critical. The lower the relative humidity (and overall amount of moisture in the air), the drier these materials and thus the easier it is for them to catch fire. The other weather factor is wind; the faster the winds, the greater the fire can spread. When NWS forecasters expect predetermined critical levels of humidity and wind they will coordinate with federal and state agencies such as the U.S. Forest Service, U.S. Fish and Wildlife Service, South Carolina Forestry Commission and Georgia Forestry Commission to discuss the fuel moisture conditions. When agreement is reached that critical levels of wind, humidity and fuels are going to be reached, the NWS will issue a Red Flag Warning signaling to everyone that conditions are prime for extreme fire behavior and that people are discouraged from lighting any fires during this period.

For more information about our fire weather program you can visit our fire weather web page at:
http://www.weather.gov/chs/fire

NWS Charleston Assists National Park Service with Sandy Response

The National Hurricane Center provided accurate forecasts of Hurricane Sandy days in advance of its eventual landfall as a post-tropical cyclone near Atlantic City, NJ on the evening of Monday, October 29th. Meanwhile, local National Weather Service (NWS) Forecast Offices in the affected areas provided the specific details, including expected impacts, that key decision makers relied on in order to prepare for Sandy and aid in ordering evacuations. Unfortunately, Sandy turned out to be just as devastating as forecasts called for across much of New Jersey, New York City and Long Island. Even well after the storm moved inland and weakened, the NWS played a critical role in aiding the response/recovery efforts.

In one such effort, NWS Charleston, SC Incident Meteorologist (IMET) John Quagliariello was deployed to assist the National Park Service (NPS) at their incident command post at Fort Wadsworth, on Staten Island, NY. Many national parks were impacted by Sandy, some with substantial damage. A NPS Incident Management Team and over 500 NPS personnel were responsible for providing emergency response and stabilization by assisting park employees, assessing and documenting conditions of NPS assets, initiating recovery of park operations and assisting community response and recovery. Some of the 19 national parks affected included:

- Statue of Liberty National Monument
- Ellis Island National Monument
- Governors Island National Monument
- Gateway National Recreation Area (Jamaica Bay, Staten Island and Sandy Hook)
- Fire Island National Seashore

John's role as Incident Meteorologist was to monitor weather conditions and prepare forecasts for all affected national parks. During daily operational briefings and various other meetings with NPS officials, important weather information was presented that could impact operations. Some weather conditions that were a concern for NPS operations included strong wind gusts, precipitation, coastal flooding and hazardous marine conditions. Long range temperature forecasts were also important, as many parks were without utilities and freezing conditions could pose a problem to buildings and museum and archival collections if proper precautions were not taken.

The biggest weather event to occur post-Sandy was a powerful nor'easter on Nov. 7th which produced 3-7" of snow and 35 mph wind gusts, along with minor coastal flooding at some parks. Based on forecasts and briefings leading up to this event, the NPS Incident Management Team was able to keep all personnel in safe locations until the storm passed.

John's recent deployment shows one of the many ways IMETs are helping the NWS meet its customers' needs. During the warm season IMETs are customarily dispatched to command posts for large wildfires to help firefighters plan suppression efforts. A growing trend is the use of IMETs and other Decision Support Meteorologists at local and state Emergency Operation Centers during large-scale weather events such as hurricanes.

If you are interested in learning more about the National Park Service response to Sandy, visit their Facebook page at www.facebook.com/HurricaneResponseNPS

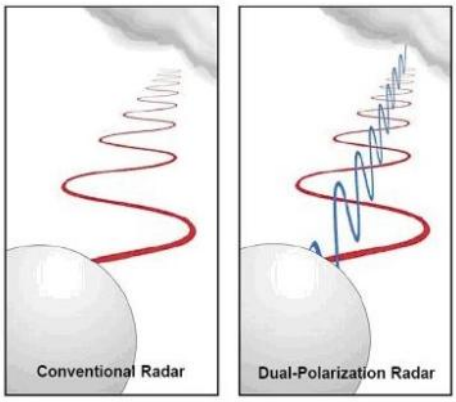
Several parks experienced substantial damage to docks and walkways, such as this brick paver damage at the Statue of Liberty National Monument.

Incident Meteorologist John Quagliariello points out the high water mark during a tour of park damage.

2012 Technology Upgrades

by Frank Alsheimer — Science and Operations Officer

Dual-Polarization Upgrade to the WSR-88D Doppler Radar



In October of 2012, the WSR-88D Doppler radar which serves south coastal SC and north coastal GA received a very important upgrade. The radar, which is actually located in Grays, SC, was retrofitted to use dual-polarization, the most significant upgrade to the NWS radar network since it was installed in the 1990s. Conventional Doppler radars send out a horizontal pulse that gives forecasters a one-dimensional picture of whatever is in the air. It can see precipitation, but can't tell the difference between rain, snow, or hail. Dual-pol radar sends and receives both horizontal and vertical pulses, providing a much more informative two-dimensional picture of the object. This allows forecasters to have a clearer understanding of differing weather types, such as hail or rain in thunderstorms, as well as non-weather features such as birds, dust, smoke, and anything else that can be picked up by the radar. It also greatly improves estimates of precipitation amounts in areas where no rain gages exist.

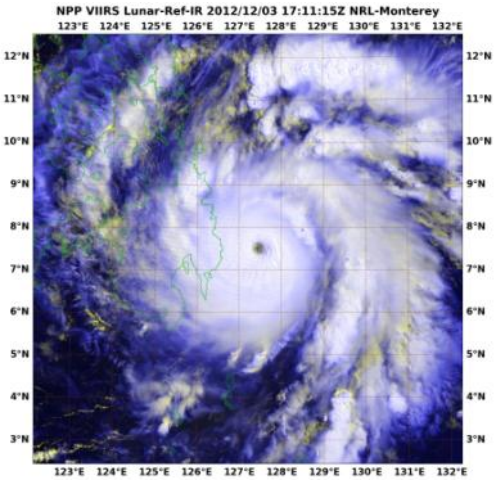
Improved Resolution of Meteorological Models

Computer models which simulate the future state of the atmosphere are one of the most important tools to weather forecasters. Unfortunately, these models are far from perfect, often times because they cannot calculate what goes on between locations where they have reliable data. Add in a dash of uncertainty inherent in measuring meteorological phenomena, and you have difficulty determining the actual state of the atmosphere at any one time. This is why weather forecasts are often not exactly right (sometimes more than others!). In order to help the models become more accurate, we need to shrink the space between data points so there is less "missing" information used when calculating the future.

During 2012, the National Centers for Environmental Prediction (NCEP), a branch of the NWS, did just that. Due to some upgraded computer power, as well as some efficiencies added into the computer code, we have increased the resolution, both in space and time, of many of our models. Some models have only half the distance between data points than before, and others now give output twice as frequently (i.e. the model gives us information about the atmosphere every 3 hours now instead of every 6 hours).

Further, the techniques to model the atmosphere have improved as our understanding of the science of meteorology has improved. All of this leads to better forecasts. Probably the best example of this is the accurate forecast of Sandy several days in advance of the storm. This allowed citizens of the northeastern U.S. to prepare well ahead of its impacts. While the death toll was still high, it likely would have been significantly higher without the improvements of the computer models.

Suomi-NPP Satellite



Suomi-NPP is a polar-orbiting satellite built jointly between NASA and NOAA and launched in late 2011. Much of its data did not become available until this year but it has already snapped some spectacular images. Of course, the satellite also sent backs all kinds of important meteorological data that were fed into our computer models, making the solutions more accurate than they would have been without the data. Here is a brief list of some of the more notable images we received from the new satellite this year:

- Very high resolution visible imagery of many tropical systems
- Imagery showing the spatial extent of blackouts after Sandy
- Images of the rapid growth of smoke plumes associated with western wildfires
- Spectacular "nighttime visible" images based on reflected moonlight

The Future

While 2012 was certainly a great year for technology, we cannot rest on our laurels. We need to continuously update our technology to the latest we can afford to provide more accurate forecasts and warnings with better lead time. There are plans in the works to make improvements to our meteorological and hydrological models in the coming years, as well as needed new satellites with improved spatial, temporal, and spectral resolutions. The background technology of the workstations within the NWS forecast offices is also expected to be improved considerably in 2013, allowing our forecasters to spend less time "working the knobs" and more time using the science to provide better forecasts, warnings, and services.